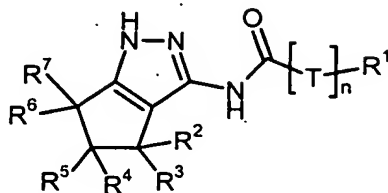


Claims

1. Compounds of general formula I, in which



(I),

in which

- R^1 stands for linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -alkinyl, C_1 - C_6 -alkoxy, C_1 - C_6 -alkylthio or C_3 - C_{12} -cycloalkyl, C_3 - C_{12} -cycloalkenyl, C_3 - C_{12} -heterocycloalkyl, C_3 - C_{12} -heterocycloalkenyl, aryl or heteroaryl, which optionally can be substituted in one or more places in the same way or differently,
- R^2 and R^3 are the same or different and stand for hydrogen, linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -alkinyl or C_1 - C_6 -alkoxy, which optionally can be substituted in one or more places in the same way or differently,
- R^4 and R^5 are the same or different and stand for hydrogen, halogen, linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -alkinyl or C_1 - C_6 -alkoxy, which optionally can be substituted in one or more places in the same way or differently, or together stand for a carbonyl group, or together form a

cyclic five- or six-ring-acetal with O,O; N,O; O,S; or S,S, which optionally can be substituted with C₁-C₆-alkyl,

or

R² and R⁴ together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently,

R⁶ and R⁷ are the same or different and stand for hydrogen, linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl or C₂-C₆-alkinyl, which optionally can be substituted in one or more places in the same way or differently, or together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently, or

R⁵ and R⁶ optionally together form a double bond, or

R³ and R⁵ together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently,

T stands for -CH₂-, -O-, -CH₂=CH₂-, -CH≡CH-, -CH₂-O-CH₂-, -CH₂-O-, -O-CH₂- or =CO, and

n stands for 0 - 6, as well as tautomers, isomers and salts thereof.

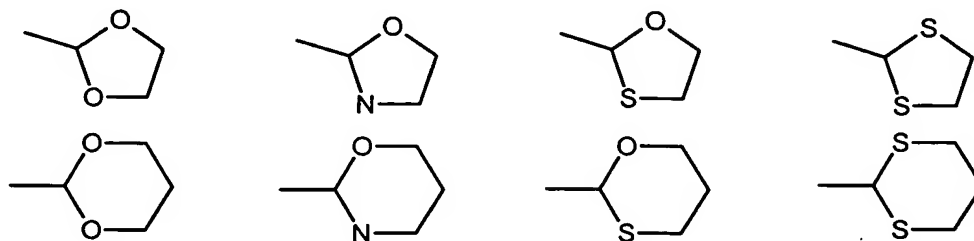
2. Compounds of general formula I, according to claim 1, in which

R¹ stands for linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkinyl, C₁-C₆-alkoxy, C₁-C₆-alkylthio or C₃-C₁₂-cycloalkyl, C₃-C₁₂-cycloalkenyl, C₃-C₁₂-heterocycloalkyl, C₃-C₁₂-heterocycloalkenyl, aryl or heteroaryl,

which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkyl, C₁₋₆-alkoxy, C₁₋₆-alkylthio, halo-C₁₋₆-alkyl, halo-C₁₋₆-alkoxy, C₁₋₆-alkoxycarbonyl, cyano, nitro, C₁₋₆-alkylsulfanyl, C₁₋₆-alkylsulfinyl, C₁₋₆-alkylsulfonyl, or with the group -C(O) C₁₋₆-alkyl, -NHC₁₋₆-alkyl, -N-di-C₁₋₆-alkyl, -CONH₂, -CONHC₁₋₆-alkyl or -CON-di-C₁₋₆-alkyl, or can be substituted with another aryl radical or heteroaryl radical that optionally itself can be substituted in one or more places in the same way or differently,

R² and R³ are the same or different and stand for hydrogen, linear or branched C₁₋₆-alkyl, C₂₋₆-alkenyl, C₂₋₆-alkinyl or C₁₋₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

R⁴ and R⁵ are the same or different and stand for hydrogen, halogen, linear or branched C₁₋₆-alkyl, C₂₋₆-alkenyl, C₂₋₆-alkinyl or C₁₋₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl, or together stand for a carbonyl group, or together form a cyclic five- or six-ring-acetal of the structure



or

R^2 and R^4 together form a C_3 - C_{12} -cycloalkyl ring or a C_3 - C_{12} -cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl,

or

R^3 and R^5 together form a C_3 - C_{12} -cycloalkyl ring or a C_3 - C_{12} -cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl,

R^6 and R^7 are the same or different and stand for hydrogen, linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl or C_2 - C_6 -alkinyl, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl, or together form a C_3 - C_{12} -cycloalkyl ring or a C_3 - C_{12} -cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl, or

R^5 and R^6 optionally together form a double bond,

T stands for $-\text{CH}_2-$, $-\text{O}-$, $-\text{CH}_2=\text{CH}_2-$, $-\text{CH}\equiv\text{CH}-$, $-\text{CH}_2-\text{O}-\text{CH}_2-$, $-\text{CH}_2-\text{O}-$, $-\text{O}-\text{CH}_2-$ or $=\text{CO}$, and

n stands for 0 - 6, as well as tautomers, isomers and salts thereof.

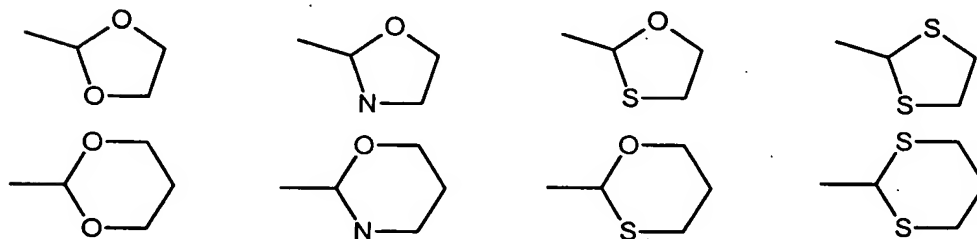
3. Compounds of general formula I, according to claims 1 and 2, in which

R^1 stands for linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -alkinyl, C_1 - C_6 -alkoxy, C_1 - C_6 -alkylthio or C_3 - C_{12} -cycloalkyl, C_3 - C_{12} -cycloalkenyl, C_3 - C_{12} -heterocycloalkyl, C_3 - C_{12} -heterocycloalkenyl, aryl or heteroaryl, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_1 - C_6 -alkyl, C_1 - C_6 -alkoxy, C_1 - C_6 -alkylthio, halo- C_1 - C_6 -alkyl, halo- C_1 - C_6 -alkoxy, C_1 - C_6 -alkoxycarbonyl, cyano, nitro, C_1 - C_6 -alkylsulfanyl, C_1 - C_6 -alkylsulfinyl, C_1 - C_6 -alkylsulfonyl, or with the group $-\text{C}(\text{O}) \text{C}_1$ - C_6 -alkyl, $-\text{NHC}_1$ - C_6 -alkyl, $-\text{N-di-C}_1$ - C_6 -alkyl, $-\text{CONH}_2$, $-\text{CONHC}_1$ - C_6 -alkyl or $-\text{CON-di-C}_1$ - C_6 -alkyl, or can be substituted with another aryl or heteroaryl radical, which optionally itself can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_1 - C_6 -alkyl, C_1 - C_6 -alkoxy, C_1 - C_6 -alkylthio, halo- C_1 - C_6 -alkyl, halo- C_1 - C_6 -alkoxy, C_1 - C_6 -alkoxycarbonyl, cyano, nitro, C_1 - C_6 -alkylcarbonyl, C_1 - C_6 -alkylsulfanyl, C_1 - C_6 -alkylsulfinyl, C_1 - C_6 -alkylsulfonyl, or with the group $-\text{C}(\text{O}) \text{C}_1$ - C_6 -alkyl, $-\text{NHC}_1$ - C_6 -alkyl, $-\text{N-di-C}_1$ - C_6 -alkyl, $-\text{CONH}_2$, $-\text{CONHC}_1$ - C_6 -alkyl or $-\text{CON-di-C}_1$ - C_6 -alkyl,

R^2 and R^3 are the same or different and stand for hydrogen, linear or branched

C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkinyl or C₁-C₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

R⁴ and R⁵ are the same or different and stand for hydrogen, halogen, linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkinyl or C₁-C₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl, or together stand for a carbonyl group, or together form a cyclic five- or six-ring-acetal of the structure



or

R² and R⁴ together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

or

R³ and R⁵ together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring,

which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

R⁶ and R⁷ are the same or different and stand for hydrogen, linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl or C₂-C₆-alkinyl, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl, or together form a C₃-C₁₂-cycloalkyl ring or a C₃-C₁₂-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl, or

R⁵ and R⁶ optionally together form a double bond,

T stands for -CH₂-, -O-, -CH₂=CH₂-, -CH=CH-, -CH₂-O-CH₂-, -CH₂-O-, -O-CH₂- or =CO, and

n stands for 0 - 6, as well as tautomers, isomers and salts thereof.

4. Compounds of general formula I, according to claims 1 to 3, in which

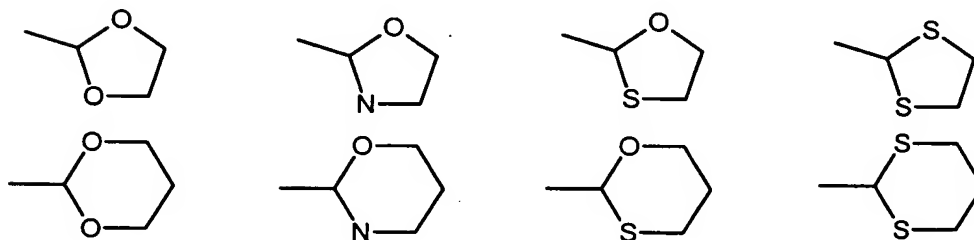
R¹ stands for linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkinyl, C₁-C₆-alkoxy, C₁-C₆-alkylthio or cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, norbornyl, adamantanyl, cyclobutenyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, cyclononenyl or cyclodecenyl, oxiranyl, oxethanyl, aziridinyl, azetidiny, tetrahydrofuranyl, pyrrolidinyl, dioxolanyl, imidazolidinyl, pyrazolidinyl, dioxanyl, piperidinyl, morpholinyl,

dithianyl, thiomorpholinyl, piperazinyl, trithianyl, quinuclidinyl,
 pyrrolinyl, imidazoliny, pyrazoliny, pyranyl, thiinyl, dihydroazetyl,
 cyclopropenyl, cyclopentadienyl, phenyl, tropyl, cyclooctadienyl, indenyl,
 naphthyl, biphenyl, azulenyl, fluorenyl, anthracenyl, thienyl, furanyl,
 pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl,
 isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, benzofuranyl,
 benzothienyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl,
 oxepinyl, azocinyl, indolizinyl, indolyl, isoindolyl, indazolyl,
 benzimidazolyl, purinyl, quinolinyl, isoquinolinyl, cinnolinyl,
 phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, pteridinyl,
 carbazolyl, acridinyl, phenazinyl, phenothiazinyl, 1,3-benzodioxol-5-yl,
 phenoxazinyl or xanthenyl, which optionally can be substituted in one or
 more places in the same way or differently with hydroxy, halogen, amino,
 C₁₋₆-alkyl, C₁₋₆-alkoxy, C₁₋₆-alkylthio, halo-C₁₋₆-alkyl, halo-C₁₋₆-alkoxy,
 C₁₋₆-alkoxycarbonyl, cyano, nitro, C₁₋₆-alkylsulfanyl, C₁₋₆-alkylsulfinyl,
 C₁₋₆-alkylsulfonyl, or can be substituted with the group -C(O) C₁₋₆-alkyl,
 -NHC₁₋₆-alkyl, -N-di-C₁₋₆-alkyl, -CONH₂, -CONHC₁₋₆-alkyl or -CON-di-
 C₁₋₆-alkyl, or can be substituted with another aryl or heteroaryl radical,
 which optionally itself can be substituted in one or more places in the
 same way or differently with hydroxy, halogen, amino, C₁₋₆-alkyl, C₁₋₆-
 alkoxy, C₁₋₆-alkylthio, halo-C₁₋₆-alkyl, halo-C₁₋₆-alkoxy, C₁₋₆-
 alkoxycarbonyl, cyano, nitro, C₁₋₆-alkylcarbonyl, C₁₋₆-alkylsulfanyl, C₁₋₆-
 alkylsulfinyl, C₁₋₆-alkylsulfonyl, or with the group -C(O) C₁₋₆-alkyl,

-NHC₁₋₆-alkyl, -N-di-C₁₋₆-alkyl, -CONH₂, -CONHC₁₋₆-alkyl or -CON-di-C₁₋₆-alkyl,

R² and R³ are the same or different and stand for hydrogen, linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkynyl or C₁-C₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

R⁴ and R⁵ are the same or different and stand for hydrogen, halogen, linear or branched C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-alkynyl or C₁-C₆-alkoxy, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl, or together stand for a carbonyl group, or together form a cyclic five- or six-ring-acetal of the structure



or

R² and R⁴ together form a C₃-C₇-cycloalkyl ring or a C₃-C₇-cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C₁₋₆-alkoxy, or with the group -NHC₁₋₆-alkyl or -N-di-C₁₋₆-alkyl,

or

R^3 and R^5 together form a C_3 - C_7 -cycloalkyl ring or a C_3 - C_7 -cycloalkenyl ring, which optionally can be substituted in one or more places in the same way of differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl,

R^6 and R^7 are the same or different and stand for hydrogen, linear or branched C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl or C_2 - C_6 -alkinyl, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl, or together form a C_3 - C_7 -cycloalkyl ring or a C_3 - C_7 -cycloalkenyl ring, which optionally can be substituted in one or more places in the same way or differently with hydroxy, halogen, amino, C_{1-6} -alkoxy, or with the group $-NHC_{1-6}$ -alkyl or $-N$ -di- C_{1-6} -alkyl, or

R^5 and R^6 optionally together form a double bond,

T stands for $-\text{CH}_2-$, $-\text{O}-$, $-\text{CH}_2=\text{CH}_2-$, $-\text{CH}\equiv\text{CH}-$, $-\text{CH}_2-\text{O}-\text{CH}_2-$, $-\text{CH}_2-\text{O}-$, $-\text{O}-\text{CH}_2-$ or $=\text{CO}$, and

n stands for 0 - 6, as well as tautomers, isomers and salts thereof.

5. Compounds of general formula I, according to claims 1 to 4, in which

R^1 stands for C_1 - C_6 -alkylthio, phenyl, biphenyl, thienyl, cyclopropyl, cyclohexyl, pyridyl, naphthyl, 1,3-benzodioxol-5-yl or isoxazolyl, which optionally can be substituted in one or more places in the same way or differently with halogen, amino, cyano, C_{1-6} -alkyl-sulfonyl, C_{1-6} -alkyl, halo- C_{1-6} -alkyl, C_{1-6} -alkoxy, C_{1-6} -alkylthio, or with the group $-\text{C}(\text{O})$ C_{1-6} -alkyl, or which can be substituted with phenyl, thienyl, naphthyl, pyridyl,

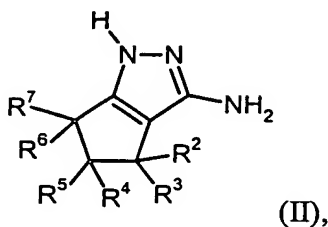
furanyl or pyrimidinyl, which optionally itself can be substituted in one or more places in the same way or differently with C₁₋₆-alkyl, C₁₋₆-alkoxy, amino, C₁₋₆-alkylsulfonyl, cyano or with the group -C(O)NH₂,

R², R³, R⁴, R⁵, R⁶ and R⁷ stand for hydrogen or C₁₋₆-alkyl,

T stands for the group -CH₂-, -CH₂-O-CH₂- or -CH₂-O-, and

n stands for 0 – 2, as well as tautomers, isomers and salts thereof.

6. Compounds of general formula II



in which R², R³, R⁴, R⁵, R⁶ and R⁷ have the meanings that are indicated in general formula I, as intermediate products for the production of the compounds of general formula I according to the invention.

7. Use of the compounds of general formula I, according to claims 1 to 5, for the production of a pharmaceutical agent for treating cancer, auto-immune diseases, chemotherapy-agent-induced alopecia and mucositis, cardiovascular diseases, infectious diseases, nephrological diseases, chronic and acute neurodegenerative diseases and viral infections.
8. Use according to claim 7, wherein cancer is defined as solid tumors and leukemia; auto-immune diseases are defined as psoriasis, alopecia and multiple sclerosis; cardiovascular diseases are defined as stenoses, arterioscleroses and restenoses; infectious diseases are defined as diseases that

are caused by unicellular parasites; nephrological diseases are defined as glomerulonephritis; chronic neurodegenerative diseases are defined as Huntington's disease, amyotrophic lateral sclerosis, Parkinson's disease, AIDS dementia and Alzheimer's disease; acute neurodegenerative diseases are defined as ischemias of the brain and neurotraumas; and viral infections are defined as cytomegalic infections, herpes, Hepatitis B and C, and HIV diseases.

9. Pharmaceutical agents that contain at least one compound according to claims 1 to 5.
10. Pharmaceutical agents according to claim 9 for treating cancer, auto-immune diseases, cardiovascular diseases, infectious diseases, nephrological diseases, neurodegenerative diseases and viral infections.
11. Compounds according to claims 1 to 5 and pharmaceutical agents according to claims 9 and 10 with suitable formulation substances and vehicles.
12. Use of the compounds of general formula I, according to claims 1 to 5, as inhibitors of the cyclin-dependent kinases.
13. Use according to claim 12, wherein the kinase is CDK1, CDK2, CDK3, CDK4, CDK5, CDK6, CDK7, CDK8 or CDK9.
14. Use of the compounds of general formula I, according to claims 1 to 5, as inhibitors of glycogen-synthase-kinase (GSK-3 β).
15. Use of the compounds of general formula I, according to claims 1 to 5, in the form of a pharmaceutical preparation for enteral, parenteral and oral administration.